ASPHALT INSTITUTE *Quarterly*

JANUARY, 1956

THE
Garden State
PARKWAY

HEAVY-DUTY HIGHWAYS
with
HOT-MIX ASPHALT

THE
NEW JERSEY
TURNPIKE

THE
TURNER
TURNPIKE

SEAL COATS

Asphalt-
The Magic Carpet

ASPHALT
IN
HYDRAULICS

ASPHALT INSTITUTE MOTION PICTURES

All Produced in 16mm, Color and Sound

TWO
ROADS

TWO ROADS The fascinating story of how two roads, one paved with asphalt, the other with concrete, were built and how they are serving the motoring public. Prepared especially for television showing or presentation to engineering groups and the general public. Length: 502 feet. Running time: 13¼ minutes.

ASPHALT—THE MAGIC CARPET Tells non-technical story of advantages of asphalt pavement construction through medium of actual present-day American Town Meeting on Long Island. Laboratory demonstrations of asphalt's physical properties. An introduction to asphalt for the general public. Length: 940 feet. Running time: 28 minutes.

SEAL COATS Methods and procedures for applying asphalt seal coats and light surface treatments. Length: 590 feet. Running time: 16½ minutes.

THE GARDEN STATE PARKWAY Story of asphalt construction on this beautiful 165-mile parkway that serves New Jersey's popular shoreline resorts. Length: 516 feet. Running time: 14½ minutes.

THE NEW JERSEY TURNPIKE Construction of this famed superhighway from foundation to finished asphalt pavement. Length: 739 feet. Running time: 20 minutes.

THE TURNER TURNPIKE Procedures employed in constructing Oklahoma's 88-mile, heavy-duty asphalt toll highway. Length: 875 feet. Running time: 25 minutes.

HEAVY-DUTY HIGHWAYS WITH HOT-MIX ASPHALT Heavy-duty asphalt highway construction in the U. S. Shows how materials are obtained and assembled, with complete asphalt plant operation. Length: 865 feet. Running time: 24 minutes.

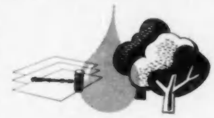
ASPHALT IN HYDRAULICS How asphalt is used to pave and protect such hydraulic installations as dams and dikes, canals, reservoirs, jetties. Shows equipment and construction methods employed. Length: 720 feet. Running time: 19 minutes.

ENGINEERING · RESEARCH · EDUCATION · THE ASPHALT INSTITUTE

These Asphalt Institute films are available on a loan basis or they may be purchased. Inquire at your nearest Asphalt Institute office (see list on page 14) for full information.

ASPHALTOPICS

Many of the world's top authorities in the field of water control and conservation gathered at the University of Utah in Salt Lake City last October 19 and 20 to participate in the First Western Conference on Asphalt in Hydraulics. First one of its kind, the meeting afforded experts from education, industry and government the opportunity to review thoroughly the vast development and progress of hydraulic construction in which asphaltic materials are employed. Reports of the outstanding success of the two-day session, sponsored by the University's Civil Engineering Department in cooperation with The Asphalt Institute and the Utah Water Users Association, emphasize the tremendous importance attained by petroleum asphalt in this vital field and point the way to even greater advancements in the future.



Add Connecticut to the list of states featuring heavy-duty asphalt pavement on their toll superhighways. Long a rigid pavement stronghold, the Nutmeg State will pave 59 percent of its new 129-mile Turnpike with asphalt, giving drivers a smooth, comfortable high-speed ride for the 76-mile stretch between Branford (near New Haven) and the Rhode Island state line.

Personal note. After fifteen years of outstanding service with The Asphalt Institute, George H. Dent has joined the staff of the Benjamin E. Beavin Company, consulting engineers of Baltimore, Md. Mr. Dent's most recent position was that of Assistant Chief Engineer at the Institute's College Park, Md., headquarters, having previously served for fourteen years as District and Division Engineer in the Atlantic-Gulf region. In years of service, Mr. Dent was dean of the Institute's engineering staff. During his tenure he made many valuable contributions to the field of asphalt technology and construction.

The idea of painting a white stripe along pavement shoulders as a highway safety device has been receiving considerable attention, with nearly half of the 48 states now showing an active interest in the development. New Jersey, for example, has now added the shoulder lines on all its major highways and nearly all of its two-lane asphalt roads. Other eastern states have reported a substantial decline in sideswipe accidents since applying the white stripes on their highways.

Have you ever noticed when driving how the dark color of asphalt pavement reduces the annoying and tiring glare from reflected sunlight and on-coming headlights. This feature provides sharp contrast for painted traffic stripes and lane markings, too, letting you see them clearly and unmistakably as they guide you safely on your way. Further reasons why

ASPHALT PAVES OUR FINEST HIGHWAYS

ASPHALT INSTITUTE *Quarterly*

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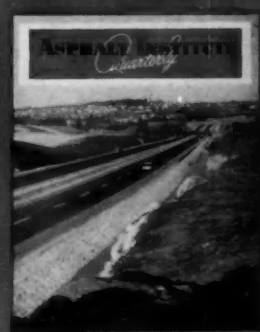
EDITOR
Richard C. Dresser

Contents

Cover

The original Maine Turnpike, completed in 1947, covers the 45-mile distance between the cities of Kittery and Portland. Last month the state turnpike authority opened an extension of this great asphalt superhighway between Portland and Augusta, the state capital, bringing the turnpike's total mileage to 111. A section of the all-asphalt extension is pictured on the cover. A story about its construction begins on page eight.

Photo: Edward D. Hipple



The Asphalt Institute Quarterly is published by The Asphalt Institute, an international, nonprofit association sponsored by members of the asphalt industry to serve both users and producers of asphaltic materials through programs of engineering, research and education.

The Member Companies of the Institute, who have made possible the publication of this magazine, are listed on page 15.

MAY 1954

Heavy trucks operated on the Malad, Idaho, test tracks for a period of 18 months.

NOVEMBER 1952

THE WASHO TEST LOOPS

WASHO

THE ASPHALT GLORY ROAD

Photos: Highway Research Board

THE WASHO Road Test at Malad, Idaho, has demonstrated beyond all question the tremendous strength of flexible asphalt pavement. It proved not only that standard thickness designs now in use carry the heaviest trucks without failure, but it also showed that even thinner sections will adequately support such heavy loads. These findings are set forth in detail in the Highway Research Board's Special Report 22, *The WASHO Road Test, Part 2: Test Data, Analyses, Findings.*

The 18-month test, sponsored by the Western Association of State Highway Officials, was conducted to determine the behavior of asphalt pavements under repeated application of heavy truck loads. Its purpose was to provide highway engineers with scientific information that could be used in designing and building better roads at less cost. That the test more than accomplished this end is indicated by these significant findings:

1. Asphalt pavements of the types commonly constructed on primary highways today can carry the heaviest legal truck loads without distress.

2. Asphalt pavements currently constructed on primary highways can support, without distress, the heaviest trucks during the critical spring thaw periods.

3. Paving the shoulders of asphalt roads will greatly increase the load-carrying capacity of the roadway and reduce the cost of maintenance.

4. An asphalt surface four inches thick is far superior to one two inches in thickness.

Located in beautiful Malad Valley of southern Idaho, the WASHO test project began in November, 1952, on two experimental roads carefully built to specifications. With the exceptions of one spring period and two mid-winter periods, a fleet of three-axle and five-axle semitrailers, their weights ranging from 18,000-lb. single axle to 40,000-lb. tandem axle, were driven over the pavement until May, 1954, while research crews under the direction of the Highway Research Board gathered and sorted test data.

FOUR-INCH PAVEMENT SUPERIOR

A pavement section 18 inches thick (including the asphalt surface) was designated as the WASHO test standard for a load of 18,000 pounds per single axle load. For comparison purposes, other sections of the two test tracks were built to weaker and stronger designs with thicknesses of 6, 10, 14 and 22 inches, respectively.

The test bore out the convictions of the engineers who specified the design of the test sections: that an asphaltic

Special instruments used in gathering test data. ***Left:*** **Roughometer determines roughness of pavement's inner and outer wheel paths.** ***Right:*** **Changes in elevation of pavement surface measured by profilometer.**

pavement four inches in thickness is far superior to a two-inch pavement and that four inches of asphaltic concrete on a sound base *will carry any legal load now travelling American highways.* It proved, moreover, that an 18,000-pound axle load can be carried safely and efficiently by even thinner asphalt roads than generally assumed. A composite pavement section only 16 inches in overall thickness including a two-inch asphaltic concrete pavement, it was discovered, will adequately carry such loads, as will even a pavement ten inches in overall thickness including a four-inch asphalt surface.

60% UNDERDESIGNED

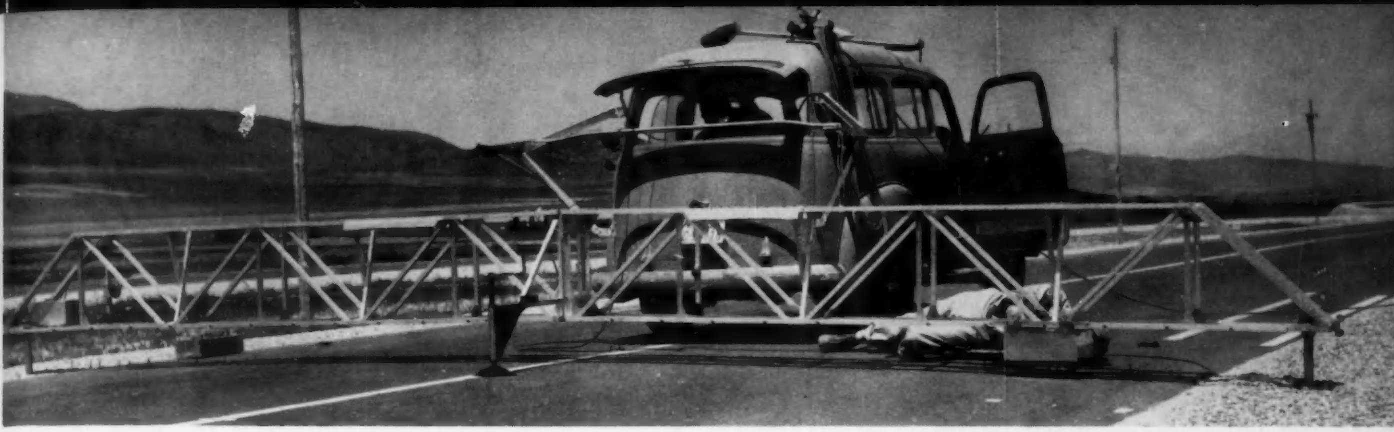
The test was conceived as a "break-up" experiment, since distress figures could be obtained only as cracks developed. Six of the ten sections on which trucks carried loads of 18,000 pounds per single axle and 32,000 pounds per tandem axle were deliberately underdesigned, as were eight of the ten sections carrying loads of 22,400 pounds per single axle and 40,000 pounds per tandem axle. In other words *60% of the entire test section was underdesigned and expected to fail under the loads that were carried.*

The failures, however, did not show up as anticipated. Cracks developed in only 25% of the total test area. Most of these (nearly 90%) occurred in the two weakest sections where engineers expected almost total failure to take place.

THICKER SECTIONS WITHSTAND THAW

The test period extended through the critical spring thaw period when the subgrade was still heavily saturated with moisture. Although the two thinnest sections, as expected, developed distress at this time, the three thicker sections having only a two-inch asphaltic concrete pavement showed far greater strength than was anticipated. Those sections having overall thicknesses of 14, 18 and 22 inches and surfaced with four inches of asphaltic concrete showed no distress at all during these critical periods. As the Highway Research Board report stated: "Regardless of the season, the thicker sections of the test pavement withstood the test traffic without failure." This statement points up the fact that *any asphalt pavement built to modern standards can rightfully claim to be an all-weather pavement entirely capable of carring all legal loads.*

Before and after views of test section having 4-inch asphaltic concrete surface. Test proved that asphalt pavements as constructed on primary highways will carry heaviest legal truck loads without distress.



SHOULDER PAVING

Another significant finding of the WASHO test was the value of shoulder paving. It was found that asphalt-paved shoulders, which can be constructed at nominal cost, not only develop the full inherent strength of any section, but also reduce maintenance costs substantially. On the Malad Valley tracks, paved shoulders gave added strength to the outer wheel path (usually the weakest area of the pavement) and made it as tough and durable as the inner wheel path, even in the thinnest sections. A comparison of the cracking in the inner and outer wheel paths clearly showed that paved shoulders on those areas having four inches of asphaltic concrete surface would have reduced distress by 80% in the six-inch section. In sections greater than six inches in overall thickness, indications are there would have been no distress at all if paved shoulders had been installed. Even in the area with two inches of asphalt pavement, it appeared that all distress would have been eliminated in sections 14 inches and thicker. These developments led the researchers to conclude that, if paved shoulders are used, the overall thickness of the pavement on the traffic lanes could be reduced by four inches as compared to a pavement without paved shoulders.

An obvious dividend resulting from paved shoulders is increased highway safety, as they provide room for slower vehicles to move temporarily to the right, allowing faster-moving vehicles to pass them safely.

Why is asphalt the world's leading road-paving material? The WASHO test road findings supply many of the answers to the engineering aspects of this question. They also serve to support the judgment of knowledgeable highway engineers of long experience who consistently specify asphalt pavement over any other type. Lower in first cost, lower in maintenance cost, smoother and more comfortable to drive on—these are additional fundamental reasons for the marked superiority of asphalt pavement, the great strength of which the WASHO test has clearly proven.

VACATIONLAND

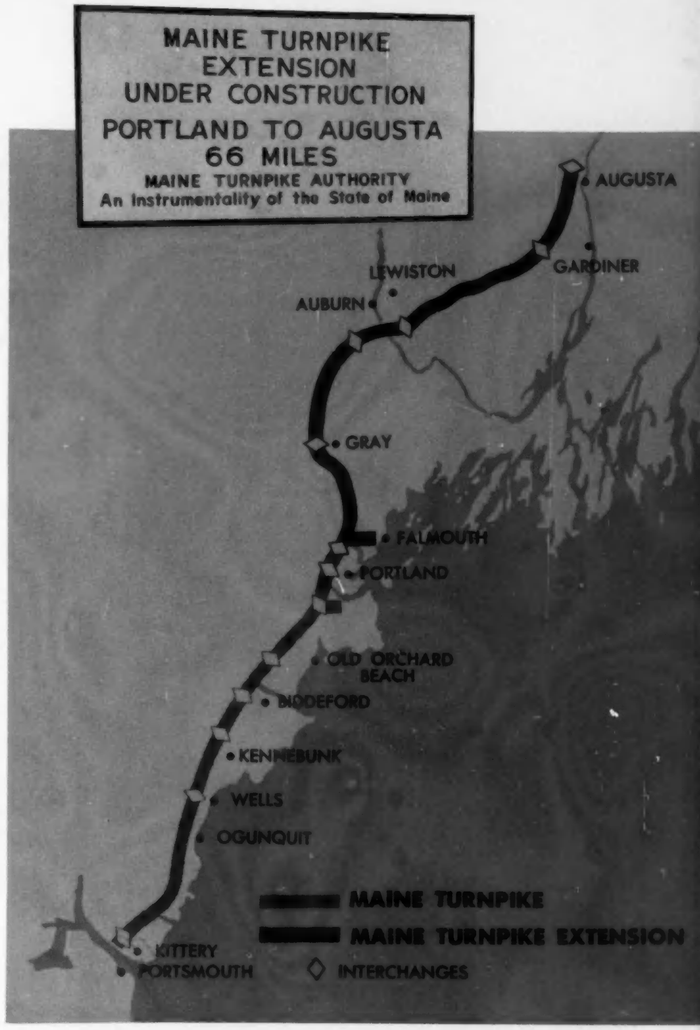
By Robert B. McKeagney
District Engineer
The Asphalt Institute

Photos: Maine Turnpike Authority

Ride the MAINE Turnpike
SWIFT — SAFE — SCENIC
EXPRESS TOLL HIGHWAY
PORTLAND TO KITTERY

Extends its Great Asphalt Turnpike

The nation's mileage of heavy-duty asphalt highways increased by 66 when the Maine Turnpike Authority opened its new Extension between Portland and the state capital at Augusta on December 13, 1955. Completion of the Extension brings the overall length of the turnpike to 111 miles and greatly expedites the flow of north-south highway traffic throughout the entire southern portion of the state. This fact will be appreciated not only by the residents of the many small cities along the turnpike and the trucking companies which serve them, but also by the hundreds of thousands of tourists from all parts of the country who annually visit the Pine Tree State to enjoy the scenic beauty of its seashore, mountains and forests and its pleasant summer climate.



OFFICIALLY OPENED ON DECEMBER 13, 1955, THE EXTENSION MAKES MAINE TURNPIKE 111 MILES LONG OVERALL

WHY THE EXTENSION WAS BUILT

Construction of The Maine Turnpike, forerunner of many great asphalt toll superhighways that have since been built, was authorized by the state legislature in 1941 as a means of quickly supplementing the overloaded primary highway system without direct cost to the state itself. The enabling act as passed by the legislature actually authorized construction of a toll facility over 400 miles in length between Kittery on the southern border and Fort Kent on the Canadian border but limited immediate construction to the portion or portions thereof which could be fully supported by tolls without backing of the general credit of the state. Because of uncertainty as to anticipated traffic volume, construction costs, etc., the initial portion of the turnpike was limited to a 45-mile section between Kittery, on the Maine-New Hampshire border, and Portland, Maine's largest city and principal seaport. This section, opened to traffic in December, 1947, has experienced increasing traffic volume each succeeding year, producing sufficient revenue to put the Authority far ahead of schedule in the amortization of the turnpike bonds.

As traffic volumes grew on the turnpike, they also increased on other Maine highways. It soon became evident to the Authority that an extension of the turnpike to serve the cities of Auburn, Lewiston and Augusta would be highly desirable as a means of further relieving the overcrowded primary highway system which, despite constant enlargement, was nevertheless inadequate to serve the increasing traffic. A survey of anticipated traffic volumes and possible revenues from such an extension, together with engineering studies and cost estimates, provided the basis for the sale of bonds in 1953 to finance construction of the 66-mile extension to Augusta. These studies also indicated the desirability of constructing a spur at a location north of Portland to provide a direct connection between the turnpike and U.S. Route 1 which extends for many miles along Maine's rugged coastline. The spur, approximately three miles in length, was incorporated at Falmouth, Maine (see map).

Penetrating the 4" of stone macadam with hot asphalt cement provides a sturdy, moisture-proof base.

Spreaders working in tandem near Falmouth apply the 1¼" heavy-duty asphalt wearing course.

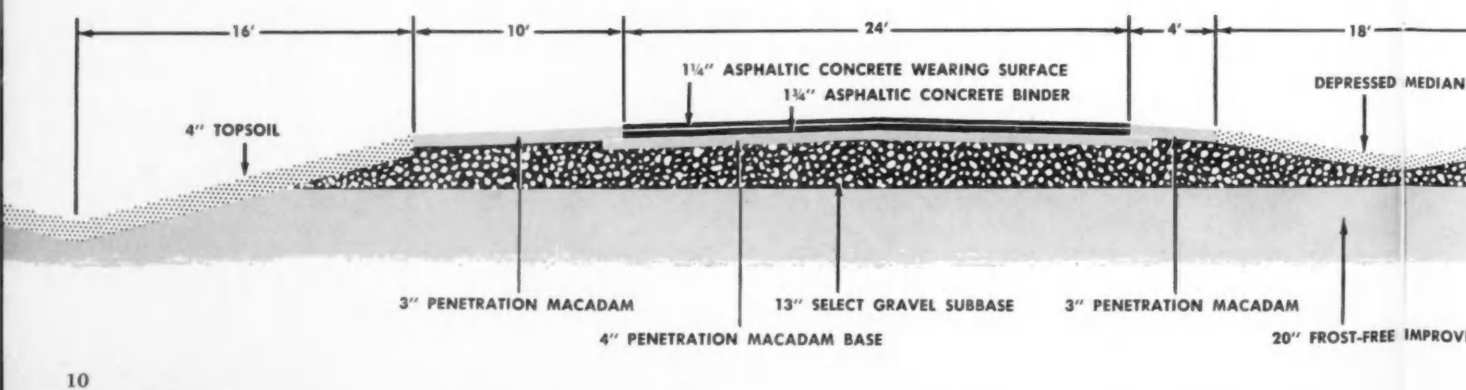
Slicing through tall stands of pine and white birch, the twin ribbons of asphalt offer the ultimate in driving comfort and pleasure.

THE TURNPIKE DESIGN

Members of the Turnpike Authority have all been well schooled in the philosophy of "Yankee Thrift" and are ardent believers in the thought that "a penny saved is a penny earned." Accordingly, they sought to improve the design of the new extension and to reduce its cost, where possible, by drawing upon experience gained in constructing the original 45-mile section. One modification which offered a substantial initial saving and indicated greater ease of maintenance was the installation of a depressed median strip. The depressed strip not only required substantially less material than was needed to construct the raised strip on the original turnpike, but it also provides better drainage from the pavement area and greatly simplifies the problems of snow removal during winter storms. An intensive study was made of the safety records of highways using both the raised and depressed type medians with the conclusion that the depressed type could be adopted with no sacrifice from the safety standpoint.

MAINE TURNPIKE EX

Typical Pavement Cros



ASPHALT PAVEMENT SELECTED

As it did in the case of the original turnpike, the Authority logically chose to pave the extension with heavy-duty asphalt. Asphalt pavements have long been the overwhelming choice of engineers in the State of Maine. Indeed, it can safely be said that Maine is "sold" on bituminous pavements as, according to U.S. Bureau of Public Roads figures for 1953, (the latest available) there existed in that year only 74 miles of rigid type pavement on the state's rural highway system, (i.e., all roads except city streets). Less costly to build, long of life and low in maintenance cost, asphalt pavement in Maine has provided travelers—natives and tourists alike—with years of smooth, comfortable and safe motoring while successfully resisting the severe strain and heaving action of the deeply-penetrating Maine winter frosts. The Authority had much good evidence to support its choice of asphalt for the state's greatest superhighway.

On the original section of the turnpike the wearing surface consisted of 7½ inches of asphaltic concrete, laid in three courses, supported by 30 inches of granular base. Pavement specified for the extension consisted of a 3-inch layer of asphaltic concrete, a 4-inch thickness of penetration macadam base course, a 13-inch layer of select gravel base and a 20-inch layer of improved subgrade. This pavement provides essentially the same thickness of pavement section as did the original pavement but a greater degree of flexibility is anticipated through utilization of penetration macadam for the lower 4 inches of the section. Specifications for the gravel base and improved subgrade were also tightened up to assure the presence of non-frost-susceptible soil for a distance of at least 40 inches beneath the pavement surface.

The shoulders, too, differ from those on the original turnpike. They consist of a 3-inch layer of emulsion-penetrated macadam over the select gravel base course which is extended full width beneath the macadam shoulder. As an added safety factor, a 4-foot interior macadam shoulder has also been provided.

CONSTRUCTION SCHEDULE

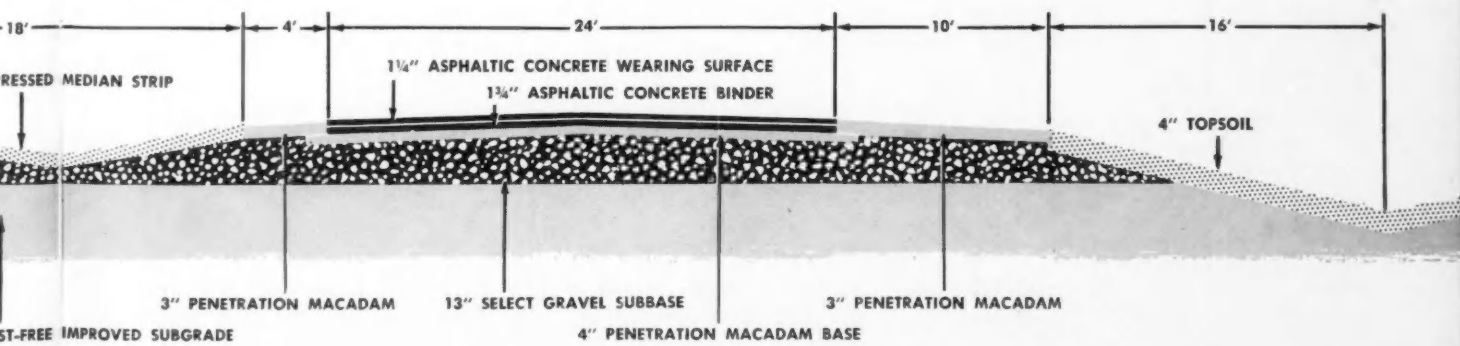
Grading operations which were scheduled for completion during the 1954 construction season called for the handling of approximately 16,000,000 cubic yards of earth. According to the schedule all embankment materials were to remain in place during the winter and would be surfaced during the 1955 season. Due, however, to possibly the wettest construction season in Maine history, including two Fall hurricanes, it became necessary to remove and waste a large amount of fine grained soil, which otherwise would have provided a suitable foundation, and to replace it with granular material. This brought the required quantities to almost 20,000,000 cubic yards, of which less than half were handled in the 1954 season. This left over half of the grading requirements, the construction of over 2,000,000 square yards of penetration macadam base course, the placement of over 340,000 tons of asphaltic concrete and the construction of over 1,000,000 square yards of macadam shoulder to be accomplished during the 1955 season. Moreover, with the exception of the grading operations, all of this work was to be done by two contractors, each of whom had but a single hot-mix plant to handle his portion of the job. That this work was finished despite the fact that the grading operations never allowed the paving operations to advance at their maximum rates is still another tribute to the great speed and ease of asphalt pavement construction.

MORE TRAFFIC EXPECTED

The turnpike's added mileage is expected to double traffic volume during 1956, with the hope that the excellent safety record of the original section—an average of only 2.54 fatalities per 100,000,000 vehicle miles over a six-year period—will be improved. Residents of Maine, as well as the thousands of out-of-state motorists who regularly journey "down east" for their vacation, can be assured that, by driving the Maine Turnpike, they will be traveling one of the nation's finest and safest superhighways—111 miles of velvet-smooth, rugged and dependable asphalt pavement, through some of the most beautiful country in the world.

IKE EXTENSION

ent Cross Section



LOUISIANA

Top: Special excavating equipment used in widening Louisiana roadways. *Right:* Spreader applies the asphalt hot-mix.

Photos: Louisiana Department of Highways

Rollers smooth out asphalt binder course atop old concrete on newly-widened highway.

By William H. Rhodes
District Engineer
The Asphalt Institute

Rolls Out The Magic Carpet

Canny Louisianans are making a wise road-building investment. Faced with the gigantic task of modernizing an outmoded primary road system and paving many miles of secondary and farm-to-market roads, the state's Department of Highways embarked on a program five years ago to try to meet the requirements of today's increased heavy traffic. Up to September, 1955, over 3,800 miles had either been constructed and improved or placed under contract for improvement. Of this total, over 3,500 miles were rehabilitated or newly constructed with asphalt pavement.

When highway commissioners and engineers initiated their plans for this vast program, the state's principal highways were in exceedingly bad shape. Built mostly of concrete only 15 to 20 years before, when traffic was light and loads were not excessive, they deteriorated rapidly under the increased volume and loads of wartime and postwar vehicles. For various reasons, rigid pavement slabs rocked and pumped and finally cracked, requiring extensive and costly repairs.

EXTENSIVE REHABILITATION REQUIRED

Lacking the money to junk the old roads and build a new system, the situation called for a thorough rehabilitation program and, with wisdom and foresight, the authorities decided to do the job with asphalt.

Asphalt, of course, is the ideal paving material for modernizing any type of road. It has undersealed and covered thousands of miles of tired, broken concrete highways throughout the United States, restoring them to greater strength, smoothness and safety than ever before. In fact the mileage of concrete highways has been steadily decreasing for many years, so rapidly has it been resurfaced with carpets of dark, rugged asphalt pavement. The low cost of asphalt construction (the cost of repairing a worn-out concrete road with concrete is so high as to be almost prohibitive) together with its speed and ease of construction, are other advantages which influenced the decision of the Louisiana officials.

WIDENING AND RESURFACING

Where heavy-duty asphaltic concrete construction is employed in the Louisiana program, pavements are being expanded to a full 24-foot width from an original 18 to 20 feet. Widening methods have varied, but in all cases the pavement overlay has consisted of a 3½-inch thickness of asphalt hot-mix or plant-mix sand asphalt laid in two courses (2-inch binder and 1½-inch wearing surface). Some 1,150 miles have thus been newly constructed or improved. In addition, nearly 2,400 miles of Louisiana secondary roads have received asphalt surface treatments.

Reports from officials of the Department of Highways indicate they are well pleased with the performance of their excellent new heavy-duty pavements and that the rehabilitation program will continue until all present narrow and deteriorating surfaces have been widened, strengthened and made safe with asphalt.

A fresh carpet of heavy-duty asphalt pavement, its white traffic stripes vivid against the dark, smooth surface.

SIDNEY GOLDIN
Chairman of Executive Committee
The Asphalt Institute

Sidney Goldin, Assistant to the Vice President for Marketing, Shell Oil Company, New York City, is Chairman of The Asphalt Institute's Executive Committee for 1956. Mr. Goldin has been in the sales promotion division of Shell since his graduation from Georgia Tech in 1930. In the next twelve years he learned petroleum merchandising in the Cleveland, St. Louis, Jacksonville and Atlanta field offices before moving to New York as assistant division manager. After a two-year tour of duty as a Navy field officer, 18 months of it spent operating tank farms and pipe lines on Guam, Mr. Goldin returned to Shell in New York as assistant manager of the asphalt department and began his vigorous association with the Institute during the ensuing decade.

THE ASPHALT INDUSTRY IS GEARED FOR 1956

By Sidney Goldin

THE asphalt industry has just closed its books on another record production year. Sales of asphalt, as reported by Asphalt Institute members, continued to climb another 16 percent.

Some conspicuously intransigent state highway administrations chose 1955 in which to take a long and thoughtful look at modern asphaltic paving. This awakening interest in our story has been accompanied by a steadily shifting pattern in highway construction in those states. The long-awaited report on the WASHO Road Test rounded out the year on an appropriately buoyant note.

In brief, 1955 might be said to be the year in which the clear superiority of heavy-duty asphalt paving was documented beyond further dispute.

And now we face another year. On the evidence at hand we have every reason to anticipate a year of tremendous gains for asphalt, all down the line. Some form of expanded federal aid for highway improvement is almost certain to be approved by the Congress. The states themselves will continue to strain against the backlog of desperately needed highway projects. Almost certainly, new toll roads will be authorized and scheduled. In the light of the industry's great strides during 1955, it is difficult to be anything but sanguine about the prospects for 1956.

This strong position is further fortified by the emerging stature of the Institute's new headquarters staff and laboratories at College Park. We are in the happy circumstance of being geared to move aggressively in the broader field of technical development. Already there is mounting interest in the use of asphalt in hydraulic engineering. We have seen asphalt groins win engineering acceptance as a logical and economical weapon in the fight to preserve our vanishing shoreline. Canal and reservoir lining offer a real challenge to engineering ingenuity. After ten years of experimentation the use of penetration asphalt in treating railroad ballast shows tremendous promise.

The forthcoming year is one full of bright promise and bristling with fresh challenges. Working in continued harmony we can confidently look forward to meeting these challenges and advancing the cause of asphalt engineering in new dimensions.

JOHN R. BANNING. *On October 26, 1955, by the death of John R. Banning, The Asphalt Institute and its sponsoring industry lost one of its loyal and able servants. Mr. Banning served for a period of twelve years as the Institute's District Engineer at Denver. He will be sorely missed by his host of friends who will long remember his sterling attributes both as an engineer and as a man.*

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Asphalt Institute Building, University of Maryland, College Park, Maryland

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Central California, Northern California, Nevada

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Anvers, Belgium

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Los Angeles, California

ROYALITE OIL COMPANY, LIMITED
Calgary, Alberta, Canada

JEFF P. ROYDER
Houston, Texas

SHELL OIL COMPANY
New York, N. Y.

SHELL OIL COMPANY
San Francisco, California

SHELL PETROLEUM COMPANY LTD.
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SOCONY MOBIL OIL CO., INC.
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STANDARD OIL COMPANY OF BRITISH COLUMBIA, LTD.
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THE STANDARD OIL COMPANY
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SUN OIL COMPANY
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